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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
09/214,001	12/24/98	KUDO H	P17380

IM22/0209

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EXAMINER	
VARCOE JR,F	
ART UNIT	**PAPER NUMBER**
1764	12

DATE MAILED: 02/09/01

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
09/214,001	Kudo et al.
Examiner	**Group Art Unit**
Varcoe	1764

☒ Responsive to communication(s) filed on *Nov 20, 2000*

~~☒ This action is FINAL.~~ This action is not final. RVS-8-01

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *3* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claim

☒ Claim(s) *1-30* is/are pending in the applicat

Of the above, claim(s) _____ is/are withdrawn from consideration

☒ Claim(s) *2-10 and 19-23* is/are allowed.

☒ Claim(s) *1, 11-18, and 24-30* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☒ The proposed drawing correction, filed on *Feb 8, 1999* is ☒ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some* ☒ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____.

☒ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☐ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

DETAILED ACTION

Response to Amendment

The Form PTO-1449 submitted January 11, 2000, is attached. The entry under "Other Documents" as originally submitted did not describe any of the items enclosed with the Information Disclosure Statement. The amendment submitted November 20, 2000, at page 14 identifies that PTO-1449 entry as referring to the Japanese document JP-A-8-106914. Examiner added that document number to the entry on the PTO-1449 to indicate which abstract is intended and initialed the entry.

The objection to the drawings as containing non-English text is withdrawn in view of the submission of drawings with English text.

The objections to claims 4 and 30 are withdrawn.

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claims 12-18 and 30 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

OK With regard to claim 12, in line 15 "said raw material unit" lacks clear antecedent basis in the claims.

OK With regard to claim 18, in line 15 "said raw material unit" lacks clear antecedent basis in the claims.

With regard to claim 30, line 11 states that the shift reaction unit and the CO oxidation OK unit are directly heated by heat from the heat source of the reforming unit (i.e., the combustion unit). But lines 15-17 state that the shift reaction unit and CO oxidation unit are indirectly heated by heat form the combustion unit. It is not clear how they can be both directly heated and indirectly heated.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 1, 11 and 24-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murray et al. EP 0 199 878 A2 in view of Tanizaki JP 07126001 A.

With regard to claim 1, Murray discloses a reforming apparatus comprising a raw material reforming unit (Fig. 2 (58); page 6 line 18), a heat source (Fig. 2 (56); page 6 line 18) that generates heat by combustion of a fuel gas operable to directly heat for the steam reformation reaction from the heat source.

Murray discloses a shift reactor unit (Fig. 2 (60); page 6 line 19).

Murray fails to disclose a CO oxidation unit for further decreasing the amount of CO by oxidation.

Tanizaki discloses a reforming apparatus comprising a reforming and shift reaction region (Fig. 1 (5)), and a CO oxidation unit (Fig. 1 (6)).

Tanizaki and Murray are analogous art in that both deal with reforming hydrocarbons to produce hydrogen.

At the time of the invention it would have been obvious to one skilled in the art to add the CO oxidation unit to the apparatus of Murray.

The motivation would have been to further reduce the concentration of CO in the reformed gas (Tanizaki, English Abstract).

Murray discloses a raw material reforming unit and a shift reaction unit containing different catalysts (reformer made from a nickel compound page 7 lines 2-3, shift catalyst made from a chromium material page 7 lines 14-15).

Murray discloses the shift reaction unit arranged (Fig. 2) so as to be indirectly heated by heat transfer from the heat source of the raw material reforming unit.

Tanizaki discloses the CO oxidation unit arranged (Fig. 1) so as to be indirectly heated by heat transfer from the heat source of the raw material reforming unit.

Tanizaki discloses the CO oxidation unit arranged in a position outside the raw material unit (Fig. 1)

Murray fails to disclose a CO oxidation unit including an outside surface arranged to obtain atmospheric cooling of the outside surface.

Tanizaki (Figure 2) discloses a CO oxidation unit including an outside surface arranged to obtain atmospheric cooling of the outside surface.

At the time of the invention it would have been obvious to one skilled in the art to design the CO oxidation ion unit with an exterior surface capable of being cooled by ambient air.

The motivation would have been to enable the CO oxidation unit to operate at temperatures cooler than the rest of the apparatus.

Thus it would have been obvious to combine the CO oxidation unit with the apparatus of Murray to get the invention of claim 1.

With regard to claim 11, Murray discloses a shift reaction unit heated by burned exhaust gas form the heat source of the raw material reforming unit (Fig. 1). Some of that heat arrives indirectly. Although Murray does not mention a CO oxidation unit, treating the CO unit of the modified apparatus of Murray the same as the shift reactor is discussed in the rejection of claim 2 above.

With regard to claim 24, Murray discloses apparatus wherein a portion of the raw material feed channel is arranged so that the raw material is heated by heat form the heat source.

That heating happens just after the raw material passes beyond the opening (94) downstream form the preheater (93).

With regard to claim 25, Murray discloses a portion of the raw material feed channel in contact with the reforming unit. This is the portion at the entrance to the reforming unit (Fig. 2).

With regard to claim 26, Murray discloses a reforming apparatus wherein a portion of the raw material feed channel contacts the burned exhaust gas from the heat source (Fig. 2).

With regard to claim 27, Murray discloses a raw material feed channel directly heated by the heat source of the raw material reforming unit (Fig. 2).

With regard to claim 28, Murray discloses a fuel feed channel arranged so as to be able to be preheated by heat form the heat source of the req material reforming unit (Fig. 2). That preheating takes place in mixing chamber (64).

With regard to claim 29, Murray discloses a combustion catalyst held in the heat source, wherein the heat source generates heat by catalytic combustion (Fig. 2). Murray also discloses a means for preheating the combustion catalyst, namely the heated spent anode gas from the fuel cell page 7 lines 19-23. In addition, it would have been obvious to use a preheater such as that

used in the raw material inlet line (93). The motivation would have been to preheat the combustion catalyst up to a temperature sufficiently high for combustion.

With regard to claim 30, Murray discloses a reforming apparatus comprising a combustion unit (Fig. 2 (56); page 6 line 18).

Murray discloses a reforming unit (Fig. 2 (58); page 6 line 18).

Murray discloses a shift reactor unit (Fig. 2 (60); page 6 line 19).

Murray fails to disclose a CO oxidation unit for further decreasing the amount of CO by oxidation.

Tanizaki discloses a reforming apparatus comprising a reforming and shift reaction region (Fig. 1 (5)), and a CO oxidation unit (Fig. 1 (6)).

Tanizaki discloses the CO oxidation unit arranged (Fig. 1) so as to be indirectly heated by heat transfer from the combustion unit (Fig 1).

Tanizaki and Murray are analogous art in that both deal with reforming hydrocarbons to produce hydrogen.

At the time of the invention it would have been obvious to one skilled in the art to add the CO oxidation unit to the apparatus of Murray.

The motivation would have been to further reduce the concentration of CO in the reformed gas (Tanizaki, English Abstract).

Murray discloses the shift reaction unit arranged (Fig. 2) so as to be indirectly heated by heat transfer from the heat source of the raw material reforming unit.

Murray discloses a reforming unit directly heated by the combustion unit (Fig. 2).

Murray discloses a shift reaction unit indirectly heated by heat transfer from the combustion unit (Fig. 2).

The temperatures at which the parts of the apparatus are operated are intended uses only and not patentable subject matter in an apparatus claim.

Thus it would have been obvious to combine the CO oxidation unit with the apparatus of Murray to get the invention of claim 30.

Allowable Subject Matter

6. Claims 2-10, 19, and 20-23 are allowable.

Claims 12-18, would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

7. The following is a statement of reasons for the indication of allowable subject matter:

Claim 2 recites a concentric arrangement of the reforming unit, the shift reactor and the CO oxidizer, with the CO oxidizer on the outside. The prior art does not disclose or fairly suggest this arrangement.

Claims 3-10 and 19 depend from claim 2.

Claim 12 recites a shift reactor arranged so as to be concentric with (i.e. coaxial with) a cylindrical combustion chamber. In addition, the claim recites a CO oxidation unit arranged so as to be concentric with (i.e. coaxial with) the combustion chamber, and located around the shift reactor. The prior does not disclose or fairly suggest a CO oxidation reactor arranged around and coaxial with a shift reactor.

Claims 13-17 are allowable because they depend from claim 12.

Claim 18 recites a shift reactor arranged so as to be concentric with (i.e. coaxial with) a cylindrical combustion chamber. In addition, the claim recites a CO oxidation unit arranged so as to be concentric with (i.e. coaxial with) the combustion chamber. The prior does not disclose or fairly suggest a CO oxidation reactor arranged around and coaxial with a shift reactor.

Claim 20 recites a shift reactor arranged so as to be concentric with (i.e. coaxial with) a cylindrical combustion chamber. In addition, the claim recites a CO oxidation unit arranged so as to be concentric with (i.e. coaxial with) the combustion chamber. Further the claim recites the shift reactor and the CO oxidation unit placed in ducts located around the main exhaust chamber. The prior art does not disclose or fairly teach placing the shift reactor and the CO oxidation reactor inside ducts and arranging the ducts around a main oxidation chamber.

Claims 21-23 are allowable because they depend from claim 20.

Response to Arguments

8. Applicant's arguments filed have been fully considered but they are not persuasive.

With regard to claim 1, Applicant notes that Murray discloses a second shift reactor external to the main reactor, the second shift reactor providing an additional shift reaction.. Since the present claim does not show such a second shift reactor, it is argued that starting with Murray, one could not arrive at the invention of claim 1, thus indicating insufficient motivation to combine. . This is not convincing because the claim does not require any shift reaction beyond that which the first, integral, shift reactor provides.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Varcoe, whose telephone number is (703) 306-5477. The examiner can normally be reached Monday through Friday from 9:00 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Marian Knode, can be reached on (703) 308-4311.

The FAX telephone number for this Group Art Unit is (703) 305-3599 (for Official papers after Final), (703) 305-5408 (for other Official papers) and (703) 305-6357 (for Unofficial papers).

When filing a FAX in Group 1700, please indicate in the Header (upper right) "Official" for papers that are to be entered into the file, and "Unofficial" for draft documents and other communications with the PTO that are not for entry into the file of the application. This will expedite processing your papers.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist whose telephone number is (703) 308-0661.

RV
February 7, 2001

Marian C Knode

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